RTCA Special Committee 186, Working Group 5

ADS-B UAT MOPS (DO-282), Revision A

Meeting #18

Teleconference on 12.08.03

**Proposed Changes to DO-282 Table 2-35 for the
Aircraft/Vehicle Length/Width Code**

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SUMMARY
This Working Paper details the text that is currently proposed for the ASA MASPS for the Aircraft/Vehicle Length/Width Code and suggests changes to the currently agreed UAT MOPS changes to conform to the ASA MASPS logic.

BACKGROUND

In the beginning there was the ADS-B MASPS, RTCA DO-242A, which in §3.4.4.6 defines the Aircraft/Vehicle Length/Width Code as:

> The "A/V Length and Width Codes" field in the MS field is a 4-bit field that describes the amount of space that an aircraft or ground vehicle occupies. The aircraft length and width codes **shall** (R3.96) be as described in Table 3-10 below. The aircraft size code is a four-bit code, in which the 3 most significant bits (the length code) classify the aircraft into one of eight length categories, and the least significant bit (the width code) classifies the aircraft into a "narrow" or "wide" subcategory.

> Each aircraft **shall** (R3.97) be assigned the smallest length and width codes for which its overall length and wingspan qualify it.

> _**Note:** For example, consider a powered glider with overall length of 24 m and wingspan of 50 m. Normally, an aircraft of that length would be in length category 1. But since the wingspan exceeds 34 m, it will not fit within even the "wide" subcategory of length category 1. Such an aircraft would be assigned length category 4 and width category 1, meaning "length less than 55 m and wingspan less than 52 m."_

> Each aircraft ADS-B participant for which the length code is 2 or more (length greater than or equal to 25 m or wingspan greater than 34 m) **shall** (R3.98) transmit its aircraft size code while it is known to be on the surface. For this purpose, the determination of when an aircraft is on the surface **shall** (R3.99) be as described in §3.4.3.1.1

Table 3-10 of DO-242A was repeated as Table 2-35 in the UAT MOPS, RTCA DO-282. Upon review of this table in the UAT SARPS Technical Manual by the ICAO WG-C UAT Subgroup, it was suggested that the equalities on the left side of each of the Length and Width definitions be eliminated. It was further suggested that the "Length" value for the largest code definitions (decimal 14 and 15) be set at "less than" some very large number, which was suggested as 200 meters. The "less than" logic was used because all of the other numbers in the "Length" column of Table 2-35 were expressed as "less than" a given length. No other changes to Table 2-35 were suggested.

AND THEN CAME THE ASA MASPS

The draft ASA MASPS (to become RTCA DO-289 if approved by the PMC on 12/9/03) defines the Aircraft/Vehicle Length/Width Code and Surveillance Position Reference Point in §3.1.2.3.2 as:

To determine the Surveillance Position Reference Point of an A/V, it is first necessary to determine the A/V's Length and Width Code. The procedure for determining the A/V Length and Width Code and the Surveillance Position reference point **shall** be as follows:

1. In a plan-view representation of the horizontal extent of the A/V (as it rests with landing gear extended on the airport surface), determine the A/V's actual length and actual width. The "actual length" is the A/V's length in the fore-and-aft direction, that is, in a direction parallel to the A/V's heading. The "actual width" is the A/Vs horizontal extent in a direction perpendicular to the fore-and-aft direction, that is, in a direction at right angles to the A/V's heading.

2. Once the actual length and actual width have been determined, enter Table 3-2 to find the smallest A/V Length/Width Code for which the actual length is less than or equal to the upper bound length for that length/width code and for which the actual width is less than or equal to the upper bound width for that length/width code.

3. Only the length/width code is transmitted in ADS-B (or possibly TIS-B) messages describing an A/V. Thus, a receiving ASA participant is not informed of an A/V's actual length and width, but only of its *reported length* and *reported width*. These are the length and the width from Table 3-2 that correspond to the A/V's reported length/width code. The reported length and reported width are the length and width of a rectangle – the *defining rectangle for the surveillance position reference point* – the center of which is the Surveillance Position Reference Point. (Refer to Figure 3-3) The following requirements determine the positioning of the defining rectangle for the surveillance position reference point:

   a. The defining rectangle for an A/V's Surveillance Position Reference Point **shall** (R3.67) have length and width equal to the upper-bound length and upper-bound width from Table 3-2 for the length/width code that is reported for that A/V.

   b. The defining rectangle for an A/V's Surveillance Position Reference Point **shall** (R3.68) be aligned parallel to the A/V's heading.

   c. The Surveillance Position Reference Point (the center of the defining rectangle) **shall** (R3.69) lie on the axis of symmetry of the A/V for an A/V's Surveillance Position Reference Point. In the case of an asymmetrical A/V, the center of the rectangle **shall** (R3.70) lie midway between the port and starboard extremities of the A/V.

   d. The forward extremity of the A/V shall (R3.71) just touch the forward end of the defining rectangle for the A/V's Surveillance Position Reference Point.
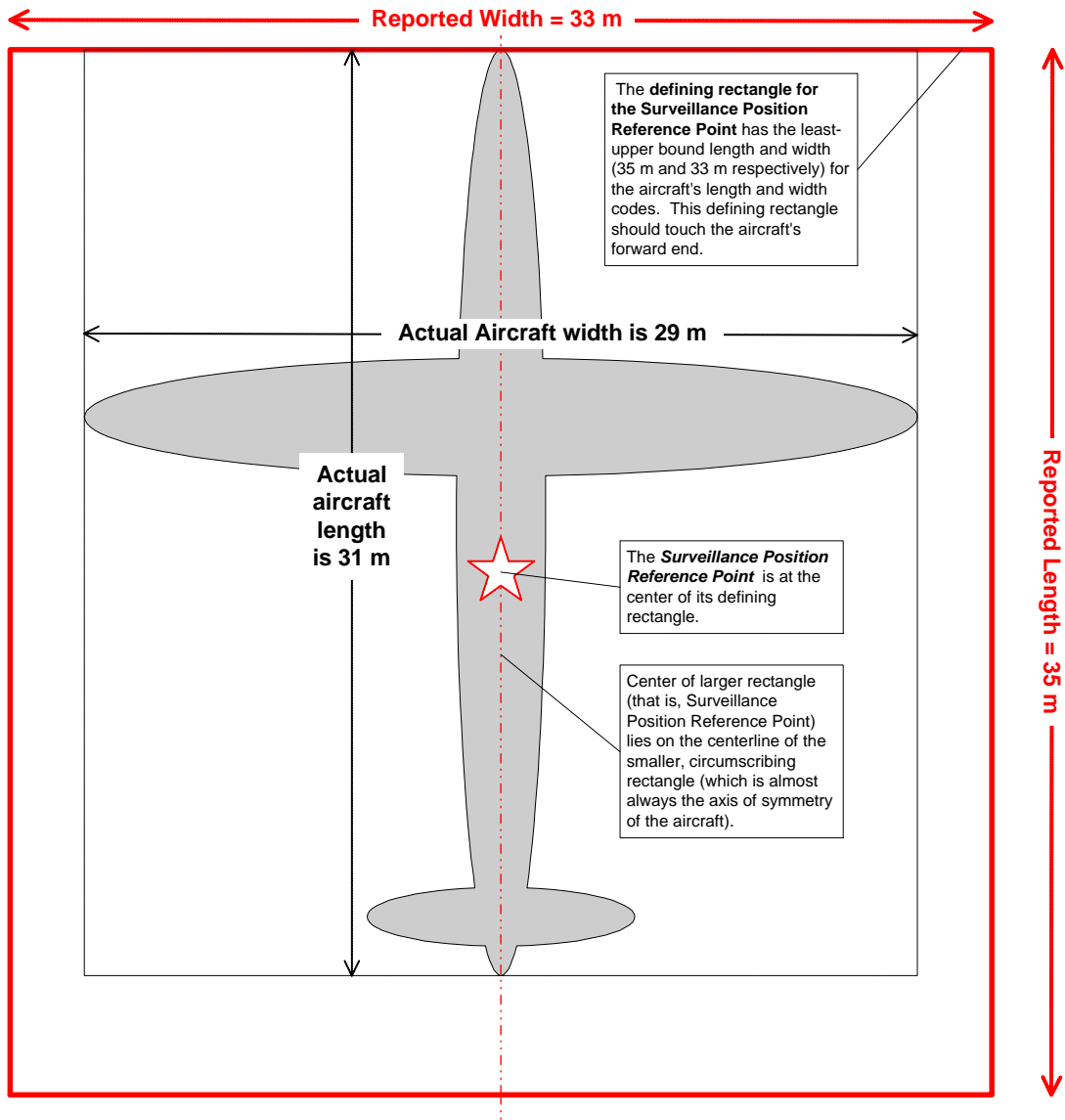
Note: *Future revisions of this MASPS may document requirements for vertical reference point.*

Table 3-2: **Upper-Bound Lengths and Widths for Each Length/Width Code**

A/V Length/Width Code (Decimal)	Length Code (Binary)	Width Code (Binary)	Upper-Bound Length and Width for Each Length/Width Code	
			Length	Width
0	000	0	15 m	11.5 m
1		1		23 m
2	001	0	25 m	28.5 m
3		1		34 m
4	010	0	35 m	33 m
5		1		38 m
6	011	0	45 m	39.5 m
7		1		45 m
8	100	0	55 m	45 m
9		1		52 m
10	101	0	65 m	59.5 m
11		1		67 m
12	110	0	75 m	72.5 m
13		1		80 m
14	111	0	85 m	80 m
15		1		90 m

__Note to Table 3-2:__　　　*If the aircraft is longer than 85 m or wider than 90 m use length / width code 15.*

Figure 3-3 illustrates the location of the Surveillance Position Reference Point, for an example aircraft of length 31 m and width 29m. Such an aircraft will have an A/V Length and Width code (§3.1.5.14) of 4 (L < 35 m and W < 33m). The Surveillance Position Reference Point is then the center of a rectangle that is 35 m long and 33 m wide and positioned as given in the requirements just stated.

Reported Width = 33 m

The **defining rectangle for the Surveillance Position Reference Point** has the least-upper bound length and width (35 m and 33 m respectively) for the aircraft's length and width codes. This defining rectangle should touch the aircraft's forward end.

Actual Aircraft width is 29 m

Actual aircraft length is 31 m

The *Surveillance Position Reference Point* is at the center of its defining rectangle.

Center of larger rectangle (that is, Surveillance Position Reference Point) lies on the centerline of the smaller, circumscribing rectangle (which is almost always the axis of symmetry of the aircraft).

Reported Length = 35 m

Figure 3-3: **Surveillance Position Reference Point Definition**

WHEN CLEARER MINDS PREVAIL

During the actual implementation of the A/V L/W Code by a Garmin software engineer, during their quest to create a UAT radio, it was pointed out that the ASA MASPS has the largest width defined as 85 meters (not 200 as in the suggested modification to the UAT MOPS) and the largest width was changed to 90 meters instead of 80 (as defined in all other documents).

A teleconference was held in the afternoon of 20 November 2003, which included Tom Foster, James Maynard, Gary Furr, Jonathan Hammer and George Ligler to discuss the ASA MASPS differences and what to do about the A/V L/W Code in all other documents in which it is now existing or proposed (including the UAT MOPS, UAT SARPS, 1090 MOPS, 1090 SARPS, and the ADS-B MASPS).

It was agreed that the largest width code (decimal 15) should have been specified in the original ADS-B MASPS, RTCA DO-242A as something larger than 80 meters, so in the ASA MASPS it was changed to 90 meters to be different from the decimal 14 width code.

It was further agreed that the largest length code (decimal 14 & 15) could not be 200 meters because even for an Airbus 380, this value would place the Surveillance Position Reference Point outside the aircraft. It was agreed during the teleconference that the value of 85 meters for length code decimal 15 was appropriate.

PROPOSED SUGGESTION

It is proposed that Working Group 5 accept the values shown in the draft ASA MASPS.